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Analyzing the Effects of U.S. Agricultural Policy on Mexican Agricultural Markets Using the MEXAGMKTS Model

Gerald T. O'Mara

This model simulation suggests that prices and trade in Mexican agricultural production are sensitive to policy changes in U.S. agriculture under a scenario of trade liberalization for Mexico.

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This paper — a product of the Agricultural Policies Division, Agriculture and Rural Development Department — is part of a larger effort in PRE to understand the dependence of domestic agricultural markets on domestic macroeconomic policy and the macroeconomic and trade policies of major trading partners. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Cicely Spooner, room N8-035, extension 30464 (23 pages with tables).

O'Mara uses results from simulations of the FAIRMODEL, USAGMKTS, and MEXAGMKTS models to analyze the effects of changes in U.S. agricultural policy on Mexican agricultural markets.

He concludes that under a scenario of trade liberalization for Mexico, Mexican agricultural production, prices, and trade are quite sensitive to agricultural policy changes in the United States.

Plausible changes in U.S. agricultural variables (of 10 percent, say) indicate possible changes of 10 to 15 percent in the border prices Mexico faces.

The extent of such changes depends on the state of the agricultural sectors and macroeconomies in the United States and the rest of the world. And the magnitude and direction of the Mexican response depends on the state of Mexico's macroeconomy and agricultural sector.

The ability to discern the effects of a given policy change in the United States, although difficult, would be of significant value to Mexican policymakers under trade liberalization.

Analyzing the Effects of U.S. Agricultural Policy on Mexican Agricultural Markets Using the MEXAGMKTS Model

by
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ANALYZING THE EFFECTS OF U.S. AGRICULTURAL POLICY ON MEXICAN AGRICULTURAL MARKETS USING THE MEXAGMKTS MODEL

I Introduction

This paper describes the results of simulating the effects of U.S. agricultural policy on Mexican agricultural markets using the MEXAGMKTS model. The genesis of the research project of which this paper is an output was the perception that agricultural policies in Mexico (and many other countries) are often second best responses to the negative side effects of broad economic policies aimed primarily at macroeconomic and international trade objectives.

The model MEXAGMKTS is a member of a set of interlinked models at macroeconomic and sectoral markets levels of Mexico and the U.S. (and enough specification of the rest of the world to close the system). The modeling of U.S. agricultural policies and markets is discussed in a companion paper by Just (1989a). The effects of U.S. macroeconomic policy variables on U.S. macroeconomic variables were simulated by use of the FAIRMODEL of the U.S. macroeconomy (Fair, 1984). Using counterfactual simulations of the FAIRMODEL, Just (1989b) analyzed the effects of U.S. macroeconomic policies on U.S. agricultural markets. Using the Just model for counterfactual simulations of U.S. agricultural policy, this paper analyzes the effects on Mexican agricultural markets of changes in U.S. policy. Thus, results from simulations of the FAIRMODEL and the USAGMKTS model of Just are used in simulating the effects of U.S. policies on Mexican agricultural markets. In the rest of this paper, the next section discusses the role of agriculture in Mexican economic policy of recent decades. The succeeding sections describe the MEXAGMKTS, FAIR and USAGMKTS models. Following these descriptions is the analysis of the sensitivity of Mexican agricultural markets to U. S. agricultural policy and a brief summary of the implications of the results.

II The Strategic Role of Agriculture in Mexican Economic Policy

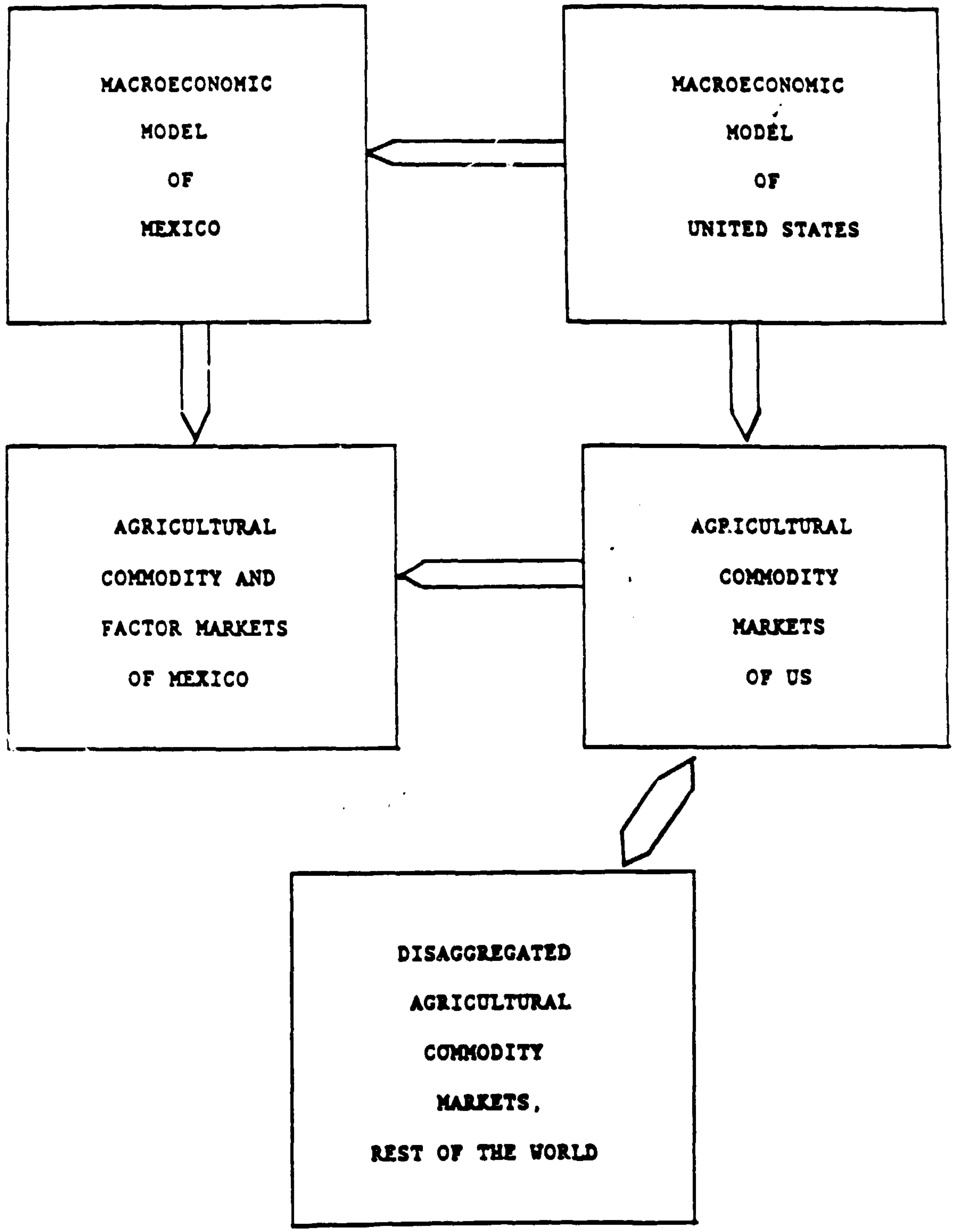
Prior to describing the model MEXAGMKTS, some background discussion of the role of agriculture in Mexican economic policy will be useful in placing the subsequent discussion of agricultural policies in appropriate context.

For almost forty years, the major thrust of Mexican policy toward agriculture has been to keep the terms at which agriculture trades with the rest of the economy favorable to urban consumers. This policy of cheap food to city dwellers was essentially aimed at stabilizing the real wage cost of blue collar workers and civil servants at a relatively low level. Such a policy facilitated import substituting industrialization and promoted peaceful industrial labor relations. However, a sustained import substituting policy insulates the economy from external competition, losing the stimulus toward cost reduction and market diversification that trade provides. Similarly, a sustained pro-urban bias tends to induce excessive urbanization, as the bloated size and heavy pollution of Mexico City attest. The cornerstone of the policy creating the urban-industrial complex in Mexico has been the use of pricing of food commodities to stabilize the real incomes of urban workers. The major safety net for the small farmer and rural workers has been migration (to the cities or the U.S.) and emigrant remittances to relatives left behind. The system of essentially fixed producer and consumer prices for basic foods imposed the necessity of government supply adjustment as quantity control instrument to manage disequilibria in food and feed grain markets. The system works as follows: In the fall when major crops are harvested, the predominant public agency in food supply operations, CONASUPO, can estimate with some accuracy the supply available from domestic production over the next year. Combining this information with estimates of food demand at existing prices produces an estimate of excess supply or demand, and hence an indication of the quantities to offer for export or to order for import. Any errors in the initial estimates of surplus or shortage (at existing prices) can be met by varying the level of government held inventories. Since the system provides no incentive for private investments in storage facilities or the holding of inventories, and even though trade in basic foods is no longer a government monopoly, the government supply adjustment mechanism is still an essential part of the food distribution system.

III MEXAGMKTS Model Structure

The objective of this model is to provide a simulation tool at the disaggregated level of individual agricultural commodity markets that will permit experiments exploring the effect on those markets of policies at the domestic macroeconomic or international (i.e., trading partner) macroeconomic and sectoral levels. The effects are to be transmitted by changes in variables that are specified as exogenous determinants of quantities demanded or supplied. In turn, the values of these linkage variables are determined in upstream models in an experimental framework of recursive causation. The structure of this framework is given in Figure 1. Note that MEXAGMKTS receives values of linkage variables from both the Mexican macroeconomic and the US (and rest of the world) agricultural markets models.

Figure 1: Schemati_ of Pattern of Major Interactions Hypothesized as an Analytical Framework



Model design specifies the interaction of markets for several important food/feed crops with markets for representative livestock commodities. Inputs are the primary factors of labor and capital and the intermediate inputs of fertilizer and feed crop commodities. Land is omitted from the specification through the use of supply functions whose key arguments are price variables. This approach is taken since the set of markets modeled does not include the markets for all agricultural commodities and important substitution relationships between factor inputs, especially land, exist between the markets modeled and those omitted. In addition, the supply of agricultural labor is linked to markets for unskilled labor nationwide (and even internationally). Thus, the wage of labor is a key linkage variable whose value is determined in the Mexican macroeconomic model.

Functional Specification of MEXAGMKTS

This section presents a functional specification of the model. A detailed specification of individual equations complete with parameter estimates is given in O'Mara and Ingco (1989). The specification starts with basic index sets and continues with descriptions of variables and equations:

Index Sets

Symbol	Description	Set Members
c	Food/Feed Crops	/maize, sorghum, soybeans/
i	Factor Inputs	/capital, labor, fertilizer/
a	Animal Stocks	/cattle, pigs, broilers, layers/
l	Livestock Comm.	/beef, pork, poultry, eggs, milk/

Variables

Name	Description
PR(c)	Production of crop c
FD(c)	Animal feed demand, crop c
HD(c)	Human food demand, crop c
GSADJ(c)	Government supply adjustment, crop c
RPG(c)	Real price guarantee, crop c
RBP(c)	Real border price, crop c
PCC(c)	Per capita human consumption, crop c
P(i)	Real price of factor i
PCON	Per capita human consumption, all commodities
POF	Index of the relative price of food
POP	Population of Mexico
INV(a)	Stocks in Mexico of animal type a
INVUS(a)	Stocks in US of animal type a
QP(l)	Production of livestock commodity l
PCL(l)	Per capita consumption, livestock commodity l
NEXP(l)	Net exports, livestock commodity l
PP(l)	Real producer price, Mexico, livestock comm. l
PPUS(l)	Real producer price in US, livestock comm. l
RP(l)	Real consumer price, Mexico, livestock comm. l
PTORT	Real consumer price, Mexico, maize tortillas

The variables P(i), PCON and POF are linkage variables from the Mexican macroeconomic model; and the variables RBP(c), INVUS(a) and PPUS(l) are linkage variables from the US (and rest of the world) agricultural markets model. The variables RPG(c) are agricultural policy variables, while the variables P(i) and NEXP(l) may also be policy variables. The variable POP is exogenous. All other variables are endogenous.

Equations

Number	Type	Functional Specification
3	Crop production	PR(c) = PR(RPG(c), P(l))
3	Animal feed demand	FD(c) = FD(RPG(c), INV(a))
1	Human food demand	HD(c) = HD[POP*PCC(PTORT,PCON,POF)]
3	Gov't supply adj.	QSADJ(c) = FD(c) + HD(c) - L[PR(c)]
4	Animal Stock Demand	INV(a) = INV(RPG(c),P(l),PP(l), L[INV(a)])
5	Livestock comm. prod	QP(l) = QP(PP(l),RPG(c),P(l), INV(a),L[QP(l)],Time)
5	Per cap cons, lvstk commodity l	PCL(l) = PCL(RP(l),POF,PCON, L[PCL(l)])
1	Net exports, lvstk commodity l	NEXP(l) = NEXP(PPUS(l),INVUS(l))
2	Consumer Price,lvstk commodity l	RP(l) = RP(PP(l), L[RP(l)])
5	Market clearing, lvstk commodity l	QP(l) - NEXP(l) = POP*PCL(l)
1	Consumer price of tortillas	PTORT = PTORT[RPG("maize")]

The thirty-three equations listed solve for thirty-three endogenous variables. Consumer prices are determined as a function of producer prices for only two livestock commodities, beef and pork. For all other livestock commodities, a time series of producer prices was not available. In these cases, the market clearing equation solves for a consumer price. The notation L[.] indicates a lagged value of the variable shown inside the brackets.

Model parameters were estimated using multivariate linear regression methods (OLS and 2SLS) using data from the Mexican Ministry of Agriculture and Water Resources (on crop and livestock production, prices, stocks, imports and exports), the Mexican Central Bank (price indices), Ministry of Programming and Budgeting (national accounts), the Mexican National Institute of Statistics and Geography, and the Foreign Agricultural Service of the US Department of Agriculture.

The economic interpretation of model equations is straightforward. The crop production equations are econometric supply functions which specify crop supply as a function of output and input prices. The feed demand equations specify food demands as a function of crop price guarantees and animal stocks. Human crop demand (for maize) is specified as the product of population and per capita demand, where the latter is determined by total per capita consumption, relative price index for food, and the retail price of tortillas, which is a function of the price guarantee for maize. The supply adjustment equations determine the quantities of imports or exports required to sustain the fixed guarantee. In brief, the equations relating to field crops embody the government supply adjustment process for market equilibration described above.

The livestock oriented equations are direct applications of microeconomic theory. Animal stocks are specified as a function of producer prices for livestock commodities, crop price guarantees, input prices and lagged stocks. Production of livestock commodities is specified as a function of producer prices, feed crop price guarantees, animal stocks and lagged production. Per capita consumption of livestock commodities is determined by consumer prices for livestock commodities, total per capita consumption, relative price for food and lagged per capita consumption of the livestock commodity. Nex exports of livestock commodities are specified as a function of producer prices and animal stocks in the US. Market clearing for livestock commodities is accomplished by determining the price which equates quantity demanded with quantity supplied.

IV The FAIRMODEL

The FAIRMODEL of the U.S. macroeconomy contains 128 equations in total, with 30 stochastic equations and 98 identities. The model consists of six sectors: household, firm, financial, federal government, state and local government and foreign. It is designed to simulate a variety of alternative U.S. macroeconomic policy scenarios. The FAIRMODEL is described in detail in Fair (1984). In the scheme of Figure 1, the FAIRMODEL generates solution values of linkage variables that are transferred to a Mexican macroeconomic model and the USAGMKTS model. For the analysis presented in this paper, lack of an adequate macroeconomic model for Mexico means that the path of effects from U.S. macropolicy via the Mexican macroeconomy to Mexican agricultural markets does not exist. Instead, linkage variables from the Mexican macroeconomy to MEXAGMKTS are fixed at historically observed levels. However, the path from U.S. macropolicy via U.S. agricultural markets does exist and is the subject of analysis. Note, however, that this path of U.S. macropolicy impacts on Mexican agricultural markets through its effect on U.S. agricultural markets. An analysis of the effects of U.S. macropolicy on U.S. agriculture using linkage variables from the FAIRMODEL to the USAGMKTS model is given in Just (1989b). Briefly, Just generates elasticity responses by computing the effects on USAGMKTS variables of one percent changes in base case levels of the following U.S. macropolicy instruments: Treasury bill rate, government expenditure, personal income tax rate and the federal deficit.

V The USAGMKTS Model

The Just model (1989a) of U.S. agricultural markets, USAGMKTS, is similar to MEXAGMKT in structure as one would expect given that both models were designed to be complementary components of an interlinked family of models. However,the USAGMKTS model (and the FAIRMODEL) are quarterly models, whereas MEXAGMKTS is necessarily annual owing to the weaker data base for Mexico. Thus, USAGMKTS has nine crop supply equations (for feedgrains and soybeans), twelve crop demand equations (for feedgrains and soybeans), ten livestock supply equations (for cattle, hogs and broilers), nine livestock demand equations (for beef, pork and broiler chicken) and one dollar exchange rate (trade-weighted) equation for a total of 41 equations and endogenous variables. To model the complexity of U.S. agricultural policies, Just defines sixteen exogenous policy variables. To model the effect of macroeconomic policies on U.S. agricultural variables, he needs only five variables from the FAIRMODEL -- overall GNP deflator, thirty-day

Treasury bill rate, disposable income, the federal deficit and the GNP deflator for non-farm sales. Just (1989a) simulates with USAGMKTS the effects of three kinds of agricultural policy change: 1) changes of plus and minus ten percent in price supports for feed grains, 2) changes of plus and minus ten percent in both price supports and target prices for feed grains and 3) a reduction of ten percent in the acreage diversion requirement for feed grain program participants. These experiments show that these agricultural policy instruments have substantial effects on U.S. agricultural prices. Plausible U.S. policy adjustments such as the abovementioned changes can cause world market prices to change by 10 to 15 percent depending on the current state of the U.S. agricultural economy.

VI <u>Experiments to Estimate the Sensitivity of Prices, Production and Traded Quantities in Mexican Agricultural Markets to U.S. Agricultural Policy</u>

For analytical clarity, it is useful to study Mexican agricultural markets using two polar modes of operation: 1) markets with decoupled linkages to world prices and quantity adjustment by the government, i.e., the Mexican policy choice of recent decades, and 2) markets open to trade at world prices. As one would expect, simulation of the historical policy choice, decoupled markets, shows no direct response whatever on Mexican agricultural markets in response to the U.S. agricultural policy changes described in section V. Of course, to the extent that U.S. policy changes affect world prices, there will be an indirect effect on the budget of the Mexican government due to the effect of changed prices on the foreign exchange value of the trading needed by the government to achieve supply adjustments on domestic markets including any adjustments of Mexican support prices induced in order to control the budgetary cost of trading operations. However, policy adjustments by the Mexican government are essentially dominated by political considerations; and, therefore, are exogenous to the analysis of the economic function of agricultural markets.

The more interesting polar case is policy choice of direct linkage to world markets in order to improve the efficiency of Mexican agriculture by confronting Mexican farmers with border prices that reflect social opportunity costs of supply and thereby inducing them to produce the commodities in which Mexico has competitive advantage. This course has been urged upon Mexico by bilateral and multilateral lenders, and the Mexican government has been moving its policy in the direction of liberalization of its trade in agricultural commodities. Elsewhere (in O'Mara and Ingco (1989)), the experiment consisting of dropping the system of guarantee (i.e., support) prices for maize, sorghum and soybeans and letting the world market determine domestic prices for these commodities was simulated over the years 1974-85. In the present paper, the model MEXAGMKTS is similarly altered so as to confront Mexican producers with world prices; but in this instance, the base case solution includes solution values of linkage variables transferred from the USAGMKTS model, which implicitly reflect base case solution values of linkage variables transferred the FAIRMODEL to the USAGMKTS model for the time periods, 1981-82 and 1984-85. The year 1983 is excluded from the analysis owing to the disruption of U.S. agricultural markets by the one year experiment with the Payment-in-Kind (PIK) program. Since the USAGMKTS and FAIRMODEL were designed to capture medium term policy responses, the simulation experiments were restricted to two year intervals. Given the lag in agricultural production response, the first year effects largely show how markets respond while holding production fixed, while the second year suggests how markets respond when production is free to change.

Policies are changed from the base case in the USAGMKTS model as follows:

I Changes of plus and minus 10 percent in support price for feed grains.

II Changes of plus and minus 10 percent in both price supports and target prices for feed grains.

III A decrease of 10 percent in the acreage diversion requirement for feed grain program participants.

Note that a support price establishes the level at which the government is willing to buy all of an agricultural commodity offered for sale to it; a target price defines the base from which the sale price is subtracted to determine the subsidy received by a participant; and required diversion acreage is the minimum acreage (expressed as a percentage) of a participating farmer's acreage included in the feed grain program. Participants receive a specified dollar subsidy for each diverted acre above a specified minimum required for program participation.

For each policy adjustment case, the difference between solution values of endogenous variables from the policy adjustment and base case values are summarized as arc elasticities which indicate the percentage response to a given percentage change in the level of a U.S. policy instrument. In order to compute the elasticities for a common time period, the quarterly results of the USAGMKTS model are converted to annual averages prior to computation of the elasticities.

Please note that the elasticities computed from these experiments are general equilibrium elasticities rather than partial equilibrium elasticities since they summarize responses that reflect all adjustments in related markets. This statement has one qualification, however; any adjustments in Mexico due to policy changes in the U.S. that are transmitted by means of effects on macrovariables of the Mexican economy are neglected in this analysis due to the lack of an adequate macroeconomic model of the Mexican economy similar to the FAIRMODEL for the U.S. economy. Thus, for all simulation experiments reported here, values of linkage variables from the Mexican macroeconomy are set at historically observed levels. In addition, the U.S. agricultural policy adjustment experiments were simulated holding the values of the macroeconomic variables transferred fron the FAIRMODEL to USAGMKTS model at the average of their values in the macroeconomic scenarios reported in Just (1989b) in order to avoid effects due to macropolicy variation and yet not condition the results on any given macropolicy specification.

The elasticity estimates of the responses of prices, production and traded quantities in Mexican feed grain, soybeans and livestock markets to U.S. agricultural policy change under Mexican trade liberalization are reported in tables 1 through 4, with tables 1 and 2 reporting results from 1981-82 and tables 3 and 4 reporting results from 1984-

85. In each of the tables, the estimates shown for changes in support prices or support and target prices are averages of the response by a given variable to plus and minus ten percent changes.

The 1981-82 results for production and prices given in Table 1 show strong responsiveness of maize and sorghum production to U.S. policy with maize production in the first year increasing 3.3 percent in response to a 10 percent increase in U.S. support prices alone or to a parallel ten percent increase in support and target prices and sorghum production decreasing 2.5 percent in response to the same increases. The induced change in soybean production is -1.2 to -1.4 percent. These effects are due to acreage substitution in favor of maize and against sorghum and soybeans.

In contrast to the greater response for foodgrains in the second year reported by Just (1989a), the MEXAGMKTS model results show a declining response in the second year. This difference in pattern of response may reflect the practice in Mexico of announcing guarantee prices before the start of the main crop season in order to influence planting decisions. This could result in a pattern of a larger production response in the first year for an annual model when behavioral relations are estimated using historical data gathered under a different policy regime.

Support for this interpretation of the pattern of response by crops is provided by the elasticity estimates for livestock prices given in table 1, which show a pattern of significant increases in the second year in accord with the pattern also reported by Just

TABLE 1: Elasticities of Response of Major Mexican Agricultural Quantities and Prices to US Agricultural Policy Changes, 1981-82 Trade Liberalization Scenario

COMMODITY	US AGRICULTURAL POLICY INSTRUMENTS Average of Plus & Minus 10% Changes Price Support	Average of Plus & Minus 10% Changes Support & Target Price	10 Percent Reduction of Diversion
FIRST YEAR			
Maize Prod	.323	.328	-.002
Sorghum Prod	-.246	-.251	-.005
Soybeans Prod	-.145	-.115	-.022
Beef Price	.517	.531	.020
Pork Price	.022	.043	-.005
Broiler Price	.179	.182	.007
SECOND YEAR			
Maize Prod	.213	.216	.013
Sorghum Prod	-.041	-.104	.054
Soybeans Prod	-.010	.131	-.122
Beef Price	.845	.881	.081
Pork Price	.172	.264	-.052
Broiler Price	.582	.591	.069

for livestock prices. Unlike the crops, livestock commodities have not been supported with guarantee prices in Mexico; hence, historical behavioral responses would have been generated by market prices subject to stochastic variation. Also, the Mexican livestock elasticities are of the same sign and about the same magnitude as the corresponding elasticities computed by Just for U.S. livestock price responses.

Also in accord with the findings of Just for the U.S., Mexican prices and production responded very weakly to a 10 percent reduction in required acreage diversion in 1981-82. Just ascribes the weak responses to a low participation rate (an average of 16%) in the foodgrain program at that time, resulting in only a small increase in crop acreage due to a reduction in required diversion.

The elasticity estimates for Mexican agricultural trade in response to U.S. agricultural policy changes shown in table 2 suggest a strong response of feedgrain imports to changes in support and target prices in the U.S. Thus, in response to 10 percent increases in either support prices or support and target prices, maize imports decrease by 8 percent in the first year and 7 percent in the second, while sorghum imports decrease by 1 percent in the first year and then increase by 5 percent in the second. In contrast, soybean imports and beef exports show little response. A ten percent reduction in required diversion produces very weak responses by all traded commodities in the first year and quite small responses in the second. The reasons advanced earlier for this effect of a diversion reduction clearly apply here also.

TABLE 2: Elasticities of Response of Mexican Agricultural Exports and Imports to US Agricultural Policy Changes, 1981-82 Trade Liberalization Scenario

	US AGRICULTURAL POLICY INSTRUMENTS		
COMMODITY	Average of Plus & Minus 10% Changes, Price Support	Average of Plus & Minus 10% Changes, Support & Target Price	10 Percent Reduction of Diversion
FIRST YEAR			
Maize Imports	-.807	-.810	-.020
Sorghum Imports	-.108	-.10[illegible]	-.004
Soybeans Imports	.011	.004	.004
Beef Exports	.000	.000	.000
SECOND YEAR			
Maize Imports	-.697	-.700	-.041
Sorghum Imports	.475	.492	-.070
Soybeans Imports	.046	-.029	.058
Beef Exports	.001	.001	-.002

The corresponding results from the simulations of responses to U.S. agricultural policy changes for the years 1984 and 1985 are presented in tables 3 and 4. In contrast to 1981-82, the responses to a 10 percent increase in either feedgrain support prices or support and target prices is weaker or more negative, with maize production increasing by 0.4 percent and sorghum production decreasing by 6.4 percent in the first year and then increasing by 0.9 percent and decreasing by 6.4 percent respectively in the second year. The difference in response between 1984-85 and the earlier period is explained by changes from 1981-82 levels in both the Mexican macroeconomy and in world feedgrain prices. Thus, in 1984-85, per capita incomes in Mexico were decreased by 15 percent from the 1981 level (due to the well known Mexican debt crisis and the macropolicy adjustment response to the crisis) and border real prices for maize and sorghum were down by 10 and 16 percent respectively. The lower incomes reduced per capita demand for livestock products and hence demand for feedgrains, despite the lower real prices. However, in Mexico maize is also an important foodgrain, albeit an inferior one. Hence, lower incomes stimulated shifts in human consumption in favor of maize offsetting the reduction in feedgrain demand for maize and resulting in a positive production elasticity. The lack of a similar demand for direct human consumption of sorghum produced the strong negative production elasticities shown. The strongly positive soybean production elasticities shown in table 3 (over 5 percent in both years) reflect a relatively constant real price and substitution of soybeans for feedgrains in farmer production plans.

The elasticities of livestock price response to a 10 percent increase in support or support and target prices are comparable in sign and magnitude to those for the 1981-82 period although the underlying explanation is more complicated, i.e., reductions in per

TABLE 3: Elasticities of Response of Major Mexican Agricultural Markets With Respect to Production & Prices to US Government Agricultural Policy Changes, 1984-85 Trade Liberalization Scenario

COMMODITY	US AGRICULTURAL POLICY INSTRUMENTS: Average of Plus & Minus 10% Changes, Price Support	Average of Plus & Minus 10% Changes, Support & Target Price	10 Percent Reduction of Diversion
FIRST YEAR			
Maize Prod	.043	.030	.009
Sorghum Prod	-.642	-.645	-.236
Soybean Prod	.559	.570	.205
Beef Price	.463	.487	.160
Pork Price	.056	.179	-.037
Broiler Price	.265	.266	.101
SECOND YEAR			
Maize Prod	.091	.093	.051
Sorghum Prod	-.636	-.640	-.376
Soybean Prod	.515	.534	.303
Beef Price	.825	.893	.394
Pork Price	.576	1.279	-.255
Broiler Price	.447	.452	.265

capita demand due to lower incomes offset the effects of lower real prices for feedgrains.

Perhaps the major difference between tables 1 and 3 is the significant quantitative increase in responses to a ten percent reduction in the acreage diversion requirement for feedgrain program participants, particularly in the second year. Just (1989a) reports that the much higher level of feedgrain program participation in 1984-85, an average of 59 percent, is responsible for the much enhanced response of U.S. agriculture to a reduction in diversion requirements. It is the enhanced supply response in the U.S. that impacts on world prices and hence on Mexican agriculture under trade liberalization. In other respects, the elasticity responses to a diversion reduction follow the pattern set by the responses to other policy changes in 1984-85.

Turning to the Mexican trade responses to U.S. agricultural policy change for 1984-85 of table 4, the signs and magnitudes of the elasticities are similar to those for 1981-82 with two exceptions: 1) very large positive trade elasticities for maize with respect to increases in support prices or support and target prices and 2) significant increases in the magnitude of responses to a reduction in diversion requirement. The first exception reflects a sharp decrease in feed demand for maize in 1984 due to the impact of a dummy variable that is a proxy for a government supply shock that resulted historically in net maize exports for that year. This effect is quite probably an artifact of model construction that should not exist under trade liberalization. The second exception is simply due to greater feedgrain program participation in the U.S. in 1984-85.

TABLE 4: Elasticities of Response of Mexican Agricultural Exports & Imports to US Government Agricultural Policy Changes, 1984-85 Trade Liberalization Scenario

COMMODITY	US AGRICULTURAL POLICY INSTRUMENTS: Average of Plus & Minus 10% Changes, Price Support	Average of Plus & Minus 10% Changes, Support & Target Price	10 Percent Reduction of Diversion
FIRST YEAR			
Maize Imports	7.119	6.854	2.517
Sorghum Imports	-0.145	-0.146	-0.052
Soybean Imports	0.020	-0.009	0.022
Beef Exports	0.000	0.000	0.000
SECOND YEAR			
Maize Imports	-0.488	-0.459	-0.284
Sorghum Imports	0.183	0.183	0.042
Soybean Imports	-0.151	-0.235	0.006
Beef Exports	0.001	0.001	0.001

Summary of Analysis of Mexican Responses to U.S. Agricultural Policy

The lesson from the preceding analysis may be quickly encapsulated by noting that the evidence suggests that Mexican agricultural production, prices and trade are quite sensitive to agricultural policy changes in the U.S. under a trade liberalization scenario. Plausible changes in the levels of U.S. agricultural policy variables, i.e., ten percent, when simulated indicate that changes of ten to fifteen percent in the border prices facing Mexico are quite possible. However, the extent of such changes depends on the state of the U.S. and rest of the world agricultural sectors and macroeconomies. In turn, the magnitude and even the direction of the Mexican response depends on the state of the Mexican macroeconomy and agricultural sector. Although difficult, the ability to discern the effects of a given policy change in the U.S. would be of significant value to policymakers in Mexico under a trade liberalization policy regime.

REFERENCES

Fair, Ray C., 1984, Specification, Estimation, and Analysis of Macro-econometric Models, Harvard University Press.

Just, Richard E., 1989a, "A Model of U.S. Corn, Sorghum and Soybean Markets and the Role of Government Programs (USAGMKTS)," unpublished paper.

Just, Richard E., 1989b, "Analysis of the Effects of U.S. Macroeconomic Policy on U.S. Agriculture Using the USAGMKTS Model," unpublished paper.

O'Mara, Gerald T. and Merlinda Ingco, 1989, "A Model of Crop and Livestock Markets in Mexico," unpublished paper.

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